

CLAIMS

We Claim:

1. A skin care, hair care, or hair coloring composition comprising:
 - (a) an effective amount of a water-soluble silk protein; and optionally
 - (b) at least one cosmetic adjuvant selected from the group consisting of fillers, surfactants, thixotropic agents, antioxidants, preserving agents, dyes, pigments, fragrances, thickeners, vitamins, hormones, moisturizers, UV absorbing sunscreens, wetting agents, cationic polymers, anionic polymers, nonionic polymers, amphoteric polymers, and hair coloring active substances.
2. The composition of Claim 1 wherein the effective amount of the water-soluble silk protein is from about 0.001 to about 90% by weight of the total weight of the composition.
3. The composition of Claim 1 wherein the water-soluble silk protein is expressed in plant or mammalian expression systems and is redissolved in water after precipitation.
4. The composition of Claim 1 wherein the water-soluble silk protein is expressed in microbial expression systems and is purified by precipitation at a temperature below about 20 °C and is redissolved in water.
5. The composition of Claim 1 wherein the water-soluble silk protein is selected from the group consisting of the dragline spider silk proteins Spidroin 1 and Spidroin 2, spider silk proteins originating from the minor ampullate gland of *Nephila clavipes*, and spider silk proteins originating from the flagelliform gland of *Nephila clavipes*, and variants thereof.
6. The composition of Claim 1 wherein the water-soluble silk protein is a spider dragline silk protein.
7. The composition of Claim 6 wherein the spider silk dragline protein is defined by the formula:
[AGQGGYGGLGXQGAGRGLGGQGAGAnGG]_z
wherein X=S, G or N; n=0-7 and z=1-75, and wherein the value of z determines the number of repeats in the variant protein and wherein the formula encompasses variations selected from the group consisting of:

(a) when $n=0$, the sequence encompassing AGRGGLGGQGAGAnGG is deleted;

(b) deletions other than the poly-alanine sequence, limited by the value of n will encompass integral multiples of three consecutive residues;

5 (c) the deletion of GYG in any repeat is accompanied by deletion of GRG in the same repeat; and

(d) where a first repeat where $n=0$ is deleted, the first repeat is preceded by a second repeat where $n=6$; and wherein the full-length protein is encoded by a gene or genes and wherein said gene or genes are not endogenous to the *Nephila clavipes* genome.

10 8. The composition of Claim 6 wherein the spider silk dragline protein is defined by the formula:

[GPGGYGPGQQGPGGYGPGQQGPGGYGPGQQGPSGPGSAn] z
wherein $n=6-10$ and $z=1-75$ and wherein, excluding the poly-alanine
15 sequence, individual repeats differ from the consensus repeat sequence by deletions of integral multiples of five consecutive residues consisting of one or both of the pentapeptide sequences GPGGY or GPGQQ and wherein the full-length protein is encoded by a gene or genes and wherein the gene or genes are not endogenous to the *Nephila clavipes* genome.

20 9. The composition of Claim 7 wherein the spider dragline protein has a repeating unit having the amino acid sequence as set forth in SEQ ID NO:1, SEQ ID NO:2, or SEQ ID NO:3.

10. The composition of Claim 6 wherein the spider dragline protein has a repeating unit having the amino acid sequence as set forth in SEQ
25 ID NO:4.

11. The composition of Claim 1 wherein the water-soluble silk protein is in a derivatized form.

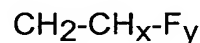
12. The composition of Claim 11 wherein the water-soluble silk protein has been derivatized with a functional group selected from the
30 group consisting of amines, oxanes, cyanates, carboxylic acid esters, silicone copolyols, siloxane esters, quaternized amine aliphatics, urethanes, polyacrylamides, dicarboxylic acid esters, and halogenated esters.

13. The composition of Claim 1 wherein the composition further
35 comprises an effective amount of a natural or recombinant protein, or a digest thereof.

14. The composition of Claim 13 wherein the natural or recombinant protein is selected from the group consisting of wheat proteins, oat proteins, rice proteins, almond proteins, soy proteins, collagen, keratins, gelatin, elastin, fibronectin, and soluble reticulin.

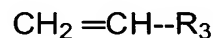
5 15. The composition of Claim 1, which is an anhydrous composition and contains 10 to 90% by weight, relative to the total weight of the composition, of a fatty phase, wherein the fatty phase contains at least one liquid, solid, or semi-solid fatty substance.

10 16. The composition of Claim 15, wherein the fatty substance is selected from the group consisting of isododecane, hydrogenated polyisobutene, squalane, isononyl isononanoate, cyclotetra- and -pentadimethicones, phenyltrimethicone, ethylene homopolymers, ethoxylated fats and oils, fluoroalkanes, microcrystalline waxes, ozocerite, beeswax, seracite, shea butter, candelilla wax, arachidyl propionate,
15 fluoropolymers represented by the monomer:



wherein $x = 1$ or 2 , and $y = 1, 2$ or 3 ,

20 and copolymers of ethylene and of at least one monomer represented by the formula:



25 wherein R_3 is an alkyl radical containing from 1 to 30 carbon atoms or an aryl or aralkyl radical.

17. The composition of Claim 1, which is in the form of an aqueous solution containing mono or polyhydric alcohols.

30 18. The composition of Claim 1, which is in the form of a crème emulsion, a gel, a dry powder, an aerosol, a mousse, an alcohol-in-oil emulsion, an alcohol and water solution, an aqueous solution, or an emulsion solution.

19. The composition of Claim 1 which is in the form of a powder and wherein the effective amount of the water-soluble silk protein is
35 present along with a pigment or filler.

20. The composition of Claim 1, which is in the form of an aqueous alkaline solution suitable for preparing compositions for coloring or bleaching hair.

5 21. The composition of Claim 1, which is in the form of a stable dispersion of water-in-oil or oil-in-water type, and comprises:

(a) a fatty phase in a proportion of from about 0.1 to about 50% by weight relative to the total weight of the composition, wherein the fatty phase contains a water-soluble silk protein, or derivative thereof, in a proportion of from about 0.001 to about 10 90% by weight relative to the total weight of the composition;

(b) an aqueous phase in a proportion of from about 50 to about 98.9% by weight relative to the total weight of the composition; and

15 (c) at least one emulsifier in a proportion of from about 1 to about 10% by weight relative to the total weight of the composition.

22. A method for forming a protective film of water-soluble silk protein on skin or hair comprising:

(a) applying to the skin or hair the composition of Claim 1; and

20 (b) allowing the formation of the water-soluble silk protein protective film on the skin or hair.